Final

Site Investigation Report
Forestry Compound – Pelham Range, Parcel 84(7)

Fort McClellan
Calhoun County, Alabama

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Task Order CK05, IT Corporation completed a site investigation (SI) at the Forestry Compound – Pelham Range, Parcel 84(7), at Fort McClellan in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site and, if present, whether the concentrations present an unacceptable risk to human health or the environment. The SI at the Forestry Compound, Parcel 84(7), consisted of the sampling and analysis of eight surface soil samples, four depositional soil samples, and eight subsurface soil samples.

Chemical analysis of samples collected at the Forestry Compound, Parcel 84(7), indicates that metals, volatile organic compounds, and chlorinated pesticides were detected in site media. Semivolatile organic compounds, organophosphorus pesticides, and chlorinated herbicides were not detected in any of the samples collected. To evaluate whether the detected constituents pose an unacceptable risk to human health or the environment, analytical results were compared to human health site-specific screening levels, ecological screening values, and background screening values for Fort McClellan. In addition, a preliminary risk assessment was performed to further characterize potential human health risk.

Although the Forestry Compound, Parcel 84(7), is under the control of the Alabama Army National Guard and is projected for continued use in military training operations, the SI analytical data were screened against residential human health site-specific screening levels to evaluate the site for possible unrestricted land reuse. Based on the results of the SI, the site can be released for unrestricted use requiring no further action.

Metals and two pesticides were identified as chemicals of potential ecological concern in surface soils at the Forestry Compound. However, the site is fenced and is projected for continued use by the Alabama Army National Guard. The site does not support substantial ecological habitat. Therefore, the potential threat to ecological receptors is expected to be minimal.

Based on the results of the SI, past operations at the Forestry Compound, Parcel 84(7), do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health and the environment.

Therefore, IT recommends "No Further Action" and unrestricted land reuse with regard to hazardous, toxic, and radioactive waste at the Forestry Compound, Parcel 84(7).

1.0 Introduction

The U.S. Army has selected Fort McClellan (FTMC), located in Calhoun County, Alabama, for closure by the Base Realignment and Closure (BRAC) Commission under Public Laws 100-526 and 101-510. The 1990 Base Closure Act, Public Law 101-510, established the process by which U.S. Department of Defense (DOD) installations would be closed or realigned. The BRAC Environmental Restoration Program requires investigation and cleanup of federal properties prior to transfer to the public domain. The U.S. Army is conducting environmental studies of the impact of suspected contaminants at parcels at FTMC under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE contracted IT Corporation (IT) to perform the site investigation (SI) at the Forestry Compound – Pelham Range, Parcel 84(7), under Contract Number DACA21-96-D-0018, Task Order CK05.

This report presents specific information and results compiled from the SI, including environmental sampling and analysis, conducted at the Forestry Compound, Parcel 84(7).

1.1 Project Description

The Forestry Compound was identified as an area to be investigated prior to property transfer. The site was classified as a Category 7 site in the environmental baseline survey (EBS) (Environmental Science and Engineering, Inc. [ESE], 1998). Category 7 sites are areas that are not evaluated and/or that require further evaluation.

A site-specific field sampling plan (SFSP) attachment (IT, 2001) and a site-specific safety and health plan (SSHP) attachment were finalized in February 2001. The SFSP and SSHP were prepared to provide technical guidance for sample collection and analysis at the Forestry Compound, Parcel 84(7). The SFSP was used in conjunction with the SSHP as attachments to the installation-wide work plan (IT, 1998) and the installation-wide sampling and analysis plan (SAP) (IT, 2000a). The SAP includes the installation-wide safety and health plan and quality assurance plan.

The SI included fieldwork to collect eight surface soil samples, four depositional soil samples, and eight subsurface soil samples to determine whether potential site-specific chemicals are present at the site and to provide data useful for supporting any future corrective measures and closure activities.

1.2 Purpose and Objectives

The SI program was designed to collect data from site media and provide a level of defensible data and information in sufficient detail to determine whether chemical constituents are present at the Forestry Compound, Parcel 84(7), at concentrations that present an unacceptable risk to human health or the environment. The conclusions of the SI in Chapter 6.0 are based on the comparison of the analytical results to human health site-specific screening levels (SSSL), ecological screening values (ESV), and background screening values for FTMC. The SSSLs and ESVs were developed by IT as part of the human health and ecological risk evaluations associated with SIs being performed under the BRAC Environmental Restoration Program at FTMC. The SSSLs and ESVs are presented in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Background metals screening values are presented in the *Final Background Metals Survey Report, Fort McClellan, Alabama* (Science Applications International Corporation [SAIC], 1998).

Based on the conclusions presented in this SI report, the BRAC Cleanup Team will decide either to propose "No Further Action" at the site or to conduct additional work at the site.

1.3 Site Description and History

The Forestry Compound, Parcel 84(7), is located on Gate 5 Road in the northeast portion of Pelham Range (Figure 1-1). The compound was used primarily to store herbicides, fungicides, and pesticides. The facility currently consists of five buildings (Buildings 8504, 8519, 8520, 8521, and 8522) and a gravel parking lot. The Forestry Compound, Parcel 84(7), is approximately 300 feet long by 200 feet wide and covers approximately 1.4 acres. The site is surrounded by a chain link fence (Figure 1-2).

Building 8504 was used as office space with no recorded storage of hazardous substances. Buildings 8519 and 8520 are wooden structures that were used to store and mix herbicides and fungicides (U.S. Army Center for Health Promotion and Preventive Medicine [CHPPM], 1999). Pesticides were also stored in the southeast end of Building 8519 prior to construction of a pesticide storage area in the northeast end of Building 8521. Building 8521 is a metal structure used for pesticide mixing and storage. The Forestry Compound is not equipped with a mixing pad. Pesticide mixing would likely have occurred on bare ground at the water source (ESE, 1998). Building 8522 contains an earthen floor and was used to park vehicles.

Building 8521 reportedly contained a foaming agent and Velpar L herbicide during a site visit in 1999. Building 8522 contained a 55-gallon drum with a spigot containing motor oil. Improper mixing has been observed outside of Building 8521. Building 8519 was deficient as a proper storage and mixing facility but was upgraded in 1990 with an epoxy-sealed cement floor in the southwestern half of the floor. The epoxy-sealed cement floor reportedly developed cracks but was repaired (CHPPM, 1999).

Since 1992, when pesticide-mixing operations were discontinued, the Forestry Compound has only been used to store granular 2,4-D Arsenical/Diquat. Seed and fertilizer are also stored in Building 8521. Releases have not been reported at the Forestry Compound (ESE, 1998).

The Forestry Compound is currently used as a storage area for road-building materials, as noticed during a site visit by IT personnel in November 2000. Road-building materials included large piping, gravel, and railroad ties.

2.0 Previous Investigations

An EBS was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with DOD guidance for fast-track cleanup at closing installations. The EBS also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria:

1. Areas where no storage, release, or disposal of hazardous substances or petroleum products has occurred (including no migration of these substances from adjacent areas)

2. Areas where only release or disposal of petroleum products has occurred

3. Areas where release, disposal, and/or migration of hazardous substances has occurred, but at concentrations that do not require a removal or remedial response

4. Areas where release, disposal, and/or migration of hazardous substances has occurred, and all removal or remedial actions to protect human health and the environment have been taken

5. Areas where release, disposal, and/or migration of hazardous substances has occurred, and removal or remedial actions are underway, but all required remedial actions have not yet been taken

6. Areas where release, disposal, and/or migration of hazardous substances has occurred, but required actions have not yet been implemented

7. Areas that are not evaluated or require additional evaluation.

The EBS was conducted in accordance with Community Environmental Response Facilitation Act (CERFA) protocols (CERFA-Public Law 102-426) and DOD policy regarding contamination assessment. Record searches and reviews were performed on all reasonably available documents from FTMC, the Alabama Department of Environmental Management (ADEM), the U.S. Environmental Protection Agency (EPA) Region IV, and Calhoun County, as well as a database search of Comprehensive Environmental Response, Compensation, and Liability Act-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historical maps and aerial photographs were

reviewed to document historical land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

The Forestry Compound, Parcel 84(7), was classified as a CERFA Category 7 parcel: areas that are not evaluated or require additional evaluation. The parcel required additional evaluation to determine its environmental condition.

3.0 Current Site Investigation Activities

This chapter summarizes SI activities conducted by IT at the Forestry Compound, Parcel 84(7), including unexploded ordnance (UXO) avoidance and environmental sampling and analysis.

3.1 UXO Avoidance

UXO avoidance was performed at the Forestry Compound, Parcel 84(7), following methodology outlined in Chapter 4.0 of the SAP (IT, 2000a). IT UXO personnel used a low-sensitivity magnetometer to perform a surface sweep of the parcel prior to site access. After the parcel was cleared for access, sample locations were monitored by UXO personnel following procedures outlined in Chapter 4.0 and Appendix E of the SAP (IT, 2000a).

3.2 Environmental Sampling

The environmental sampling performed during the SI at the Forestry Compound, Parcel 84(7), included the collection of surface, depositional, and subsurface soil samples for chemical analysis. The sample locations were determined by observing site physical characteristics during a site walkover and by reviewing historical documents pertaining to activities conducted at the site. The sample locations, media, and rationale are summarized in Table 3-1. Sampling locations are shown on Figure 3-1. Samples were submitted for laboratory analysis of site-related parameters listed in Section 3.4.

3.2.1 Surface and Depositional Soil Sampling

Eight surface soil samples and four depositional soil samples were collected at the Forestry Compound, Parcel 84(7), as shown on Figure 3-1. Soil sampling locations and rationale are presented in Table 3-1. Sample designations and analytical parameters are listed in Table 3-2. Soil sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, site topography, and proximity to buried utilities.

Sample Collection. Surface and depositional soil samples were collected from the upper 1 foot of soil with a stainless-steel hand auger using the methodology specified in Section 4.9.1.1 of the SAP (IT, 2000a). Surface and depositional soil samples were collected by first removing surface debris (e.g., rocks or vegetation) from the immediate sample area. The soil was then collected with the sampling device and screened with a photoionization detector (PID) in

accordance with Section 4.7.1.1 of the SAP (IT, 2000a). The soil fraction for volatile organic compound (VOC) analysis was collected directly from the sampler using three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4.

3.2.2 Subsurface Soil Sampling

Subsurface soil samples were collected from eight soil borings at the Forestry Compound, Parcel 84(7), as shown on Figure 3-1. Subsurface soil sampling locations and rationale are presented in Table 3-1. Subsurface soil sample designations, depths, and analytical parameters are listed in Table 3-2. Soil boring sampling locations were determined in the field by the on-site geologist based on the sampling rationale, presence of surface structures, site topography, and proximity to utilities. IT contracted Environmental Services Network, Inc., a direct-push technology (DPT) subcontractor, to assist in subsurface soil sample collection.

Sample Collection. Subsurface soil samples were collected from soil borings at depths greater than 1 foot below ground surface (bgs) in the unsaturated zone. The soil borings were advanced and soil samples collected using the DPT sampling procedures specified in Section 4.9.1.1 of the SAP (IT, 2000a). Sample collection logs are included in Appendix A. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4.

Subsurface soil samples were collected continuously to 12 feet bgs or until DPT sampler refusal was encountered. Samples were field-screened using a PID in accordance with Section 4.7.1.1 of the SAP (IT, 2000a) to measure for volatile organic vapors. The soil sample displaying the highest reading was selected and sent to the laboratory for analysis; however, at those locations where PID readings were not greater than background, the deepest soil sample interval above the saturated zone was submitted for analysis. The soil fraction for VOC analysis was collected directly from the sampler using three EnCore® samplers. The remaining portion of the sample was transferred to a clean stainless-steel bowl, homogenized, and placed in the appropriate sample containers. The samples were analyzed for the parameters listed in Table 3-2 using methods outlined in Section 3.4. The on-site geologist constructed a detailed boring log for each soil boring. The lithological log for each borehole is included in Appendix B.

At the completion of soil sampling, boreholes were abandoned with bentonite pellets and hydrated with potable water following borehole abandonment procedures summarized in Appendix B of the SAP (IT, 2000a).

3.3 Surveying of Sample Locations

Sample locations were surveyed using global positioning system survey techniques described in Section 4.3 of the SAP and conventional civil survey techniques described in Section 4.19 of the SAP (IT, 2000a). Horizontal coordinates were referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum of 1983. Elevations were referenced to the North American Vertical Datum of 1988. Horizontal coordinates and elevations are included in Appendix C.

3.4 Analytical Program

Samples collected during the SI were analyzed for various chemical parameters based on the potential site-specific chemicals and on EPA, ADEM, FTMC, and USACE requirements. Samples collected at the Forestry Compound, Parcel 84(7), were analyzed for the following parameters:

- Target compound list VOCs – EPA Method 8260B
- Target compound list semivolatile organic compounds (SVOC) – EPA Method 8270C
- Target analyte metals – EPA Method 6010B/7000
- Chlorinated herbicides – EPA Method 8151A
- Chlorinated pesticides – EPA Method 8081A
- Organophosphorus pesticides – EPA Method 8141A.

The samples were analyzed using EPA SW-846 methods, including Update III methods where applicable, as presented in Table 6-1 in Appendix B of the SAP (IT, 2000a).

3.5 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping followed requirements specified in Section 4.13.2 of the SAP (IT, 2000a). Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SI are listed in Table 5-1 of Appendix B of the SAP (IT, 2000a). Sample documentation and chain-of-custody records were completed as specified in Section 4.13 of the SAP (IT, 2000a).

Completed analysis request and chain-of-custody records (Appendix A) were secured and included with each shipment of sample coolers to EMAX Laboratories, Inc. in Torrance, California. Split samples were shipped to the USACE South Atlantic Division Laboratory in Marietta, Georgia.

3.6 Investigation-Derived Waste Management and Disposal

Investigation-derived waste (IDW) was managed and disposed as outlined in Appendix D of the SAP (IT, 2000a). The IDW generated during the SI at the Forestry Compound, Parcel 84(7), was segregated as follows:

- Soil boring cuttings
- Decontamination fluids
- Personal protective equipment.

Solid IDW was stored on site in lined roll-off bins prior to characterization and final disposal. Solid IDW was characterized using toxicity characteristic leaching procedure analysis. Based on the results, soil boring cuttings and personal protective equipment generated during the SI were disposed as nonregulated waste at the Industrial Waste Landfill on the Main Post of FTMC.

Liquid IDW was contained in a portable frac tank at the site pending waste characterization. Liquid IDW was characterized by VOC, SVOC, and metals analyses. Based on the analyses, liquid IDW was discharged as nonregulated waste.

3.7 Variances/Nonconformances

No variances or nonconformances to the SFSP were recorded during completion of the SI at the Forestry Compound, Parcel 84(7).

3.8 Data Quality

The field sample analytical data are presented in tabular form in Appendix D. The field samples were collected, documented, handled, analyzed, and reported in a manner consistent with the SI work plan; the FTMC SAP and quality assurance plan; and standard, accepted methods and procedures. Data were reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of Appendix B of the SAP [IT, 2000a]). Chemical

data were reported via hard-copy data packages by the laboratory using Contract Laboratory Program-like forms.

Data Validation. The reported analytical data were validated in accordance with EPA National Functional Guidelines by Level III criteria. The data validation results are summarized in a quality assurance report, which includes the data validation summary report (Appendix E). Selected results were rejected or otherwise qualified based on the implementation of accepted data validation procedures and practices. These qualified parameters are highlighted in the report. The validation-assigned qualifiers were added to the FTMC IT Environmental Management System™ database for tracking and reporting. The qualified data were used in the comparisons to the SSSLs and ESVs. Rejected data (assigned an "R" qualifier) were not used. The data presented in this report, except where qualified, meet the principle data quality objective for this SI.

4.0 Site Characterization

Subsurface investigations performed at the Forestry Compound, Parcel 84(7), provided soil and geologic data used to characterize the geology of the site. Because no groundwater monitoring wells were installed at the site, a hydrogeological characterization was not performed.

4.1 Regional and Site Geology

4.1.1 Regional Geology

Calhoun County includes parts of two physiographic provinces, the Piedmont Upland Province and the Valley and Ridge Province. The Piedmont Upland Province occupies the extreme eastern and southeastern portions of the county and is characterized by metamorphosed sedimentary rocks. The generally accepted range in age of these metamorphics is Cambrian to Devonian.

The majority of Calhoun County, including the Main Post of FTMC, lies within the Appalachian fold-and-thrust structural belt (Valley and Ridge Province), where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. The fold-and-thrust belt consists of Paleozoic sedimentary rocks that have been asymmetrically folded and thrust-faulted, with major structures and faults striking in a northeast-southwest direction.

Northwestward transport of the Paleozoic rock sequence along the thrust faults has resulted in the imbricate stacking of large slabs of rock, referred to as thrust sheets. Within an individual thrust sheet, smaller faults may splay off the larger thrust fault, resulting in imbricate stacking of rock units within an individual thrust sheet (Osborne and Szabo, 1984). Geologic contacts in this region generally strike parallel to the faults, and repetition of lithologic units is common in vertical sequences. Geologic formations within the Valley and Ridge Province portion of Calhoun County have been mapped by Warman and Causey (1962), Osborne and Szabo (1984), and Moser and DeJarnette (1992) and vary in age from Lower Cambrian to Pennsylvanian.

The basal unit of the sedimentary sequence in Calhoun County is the Cambrian Chilhowee Group. The Chilhowee Group consists of the Cochran, Nichols, Wilson Ridge, and Weisner Formations (Osborne and Szabo, 1984) but in Calhoun County is either undifferentiated or divided into the Cochran and Nichols Formations and an upper, undifferentiated Wilson Ridge

and Weisner Formation. The Cochran is composed of poorly sorted arkosic sandstone and conglomerate with interbeds of greenish-gray siltstone and mudstone. Massive to laminated greenish-gray and black mudstone makes up the Nichols Formation, with thin interbeds of siltstone and very fine-grained sandstone (Szabo et al., 1988). These two formations are mapped only in the eastern part of the county.

The Wilson Ridge and Weisner Formations are undifferentiated in Calhoun County and consist of both coarse-grained and fine-grained clastics. The coarse-grained facies appears to dominate the unit and consists primarily of coarse-grained, vitreous quartzite and friable, fine- to coarse-grained, orthoquartzitic sandstone, both of which locally contain conglomerate. The fine-grained facies consists of sandy and micaceous shale and silty, micaceous mudstone which are locally interbedded with the coarse clastic rocks. The abundance of orthoquartzitic sandstone and quartzite suggests that most of the Chilhowee Group bedrock in the vicinity of FTMC belongs to the Weisner Formation (Osborne and Szabo, 1984).

The Cambrian Shady Dolomite overlies the Weisner Formation northeast, east, and southwest of the Main Post and consists of interlayered bluish-gray or pale yellowish-gray sandy dolomitic limestone and siliceous dolomite with coarsely crystalline, porous chert (Osborne et al., 1989). A variegated shale and clayey silt have been included within the lower part of the Shady Dolomite (Cloud, 1966). Material similar to this lower shale unit was noted in core holes drilled by the Alabama Geologic Survey on FTMC (Osborne and Szabo, 1984). The character of the Shady Dolomite in the FTMC vicinity and the true assignment of the shale at this stratigraphic interval are still uncertain (Osborne, 1999).

The Rome Formation overlies the Shady Dolomite and locally occurs to the northwest and southeast of the Main Post, as mapped by Warman and Causey (1962) and Osborne and Szabo (1984), and immediately to the west of Reilly Airfield (Osborne and Szabo, 1984). The Rome Formation consists of variegated, thinly interbedded grayish-red-purple mudstone, shale, and siltstone and greenish-red and light gray sandstone, with locally occurring limestone and dolomite. The Conasauga Formation overlies the Rome Formation and occurs along anticlinal axes in the northeastern portion of Pelham Range (Warman and Causey, 1962; Osborne and Szabo, 1984) and the northern portion of the Main Post (Osborne et al., 1997). The Conasauga Formation is composed of dark gray, finely to coarsely crystalline, medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989).

Overlying the Conasauga Formation is the Knox Group, which is composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group is undifferentiated in Calhoun County and consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone that weather to a chert residuum (Osborne and Szabo, 1984). The Knox Group underlies a large portion of the Pelham Range area.

The Ordovician Newala and Little Oak Limestones overlie the Knox Group. The Newala Limestone consists of light to dark gray, micritic, thick-bedded limestone with minor dolomite. The Little Oak Limestone consists of dark gray, medium- to thick-bedded, fossiliferous, argillaceous to silty limestone with chert nodules. These limestone units are mapped together as undifferentiated at FTMC and in other parts of Calhoun County. The Athens Shale overlies the Ordovician limestone units. The Athens Shale consists of dark gray to black shale and graptolitic shale with localized interbedded dark gray limestone (Osborne et al., 1989). These units occur within an eroded "window" in the uppermost structural thrust sheet at FTMC and underlie much of the developed area of the Main Post.

Other Ordovician-aged bedrock units mapped in Calhoun County include the Greensport Formation, Colvin Mountain Sandstone, and Sequatchie Formation. These units consist of various siltstones, sandstones, shales, dolomites, and limestones and are mapped as one, undifferentiated unit in some areas of Calhoun County. The only Silurian-age sedimentary formation mapped in Calhoun County is the Red Mountain Formation. This unit consists of interbedded red sandstone, siltstone, and shale with greenish-gray to red silty and sandy limestone.

The Devonian Frog Mountain Sandstone consists of sandstone and quartzitic sandstone with shale interbeds, dolomudstone, and glauconitic limestone (Szabo et al., 1988). This unit locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of dark to light gray limestone with abundant chert nodules and greenish-gray to grayish-red phosphatic shale, with increasing amounts of calcareous chert toward the upper portion of the formation (Osborne and Szabo, 1984). These units occur in the

northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian age, which consists of thin-bedded, fissile, brown to black shale with thin intercalated limestone layers and interbedded sandstone. Osborne and Szabo (1984) reassigned the Floyd Shale, which was mapped by Warman and Causey (1962) on the Main Post of FTMC, to the Ordovician Athens Shale on the basis of fossil data.

The Jacksonville Thrust Fault is the most significant structural geologic feature in the vicinity of FTMC, both for its role in determining the stratigraphic relationships in the area and for its contribution to regional water supplies. The trace of the fault extends northeastward for approximately 39 miles between Bynum, Alabama, and Piedmont, Alabama. The fault is interpreted as a major splay of the Pell City Fault (Osborne and Szabo, 1984). The Ordovician sequence that makes up the Eden thrust sheet is exposed at FTMC through an eroded "window," or "fenster," in the overlying thrust sheet. Rocks within the window display complex folding, with the folds being overturned and tight to isoclinal. The carbonates and shales locally exhibit well-developed cleavage (Osborne and Szabo, 1984). The FTMC window is framed on the northwest by the Rome Formation, north by the Conasauga Formation, northeast, east, and southwest by the Shady Dolomite, and southeast and southwest by the Chilhowee Group (Osborne et al., 1997).

4.1.2 Site Geology

Soils at the Forestry Compound consist of the Decatur and Cumberland clay loams, 6 to 10 percent slopes, severely eroded (DcC3), and Cumberland gravelly clay loam, 10 to 25 percent slopes, severely eroded (CrD3) (U.S. Department of Agriculture, 1961).

The Decatur series consists of strongly acidic, well-drained soils that have developed on uplands from limestone residuum and old valley fill of similar origin. The surface soil is generally dark reddish-brown loam and the subsoil is dark-red, silty clay. The Decatur soils are associated with the Dewey, Fullerton, and Clarksville soils. The Decatur is well drained and has limestone residuum on uplands. The typical soil description is 3 to 20 feet of well-drained loams to silty clays, developed in old alluvium that washed from soils developed from limestone, chert, and shale.

The Cumberland series consists of a deep, well-drained gravelly loam and gravelly silty clay soils on stream terraces. The alluvium is 2 to 15 feet thick and is underlain in places by beds of gravel or sand.

The bedrock underlying Parcel 84(7) is mapped as the Cambrian Conasauga Formation. The southern boundary of the site is in close proximity to the contact with the undifferentiated Cambro-Ordovician Knox Group; however, because bedrock was not encountered during subsurface investigations, the precise location of the Conasauga Formation/Knox Group contact is unknown. The Conasauga Formation is composed of dark gray, finely to coarsely crystalline, medium- to thick-bedded dolomite with minor shale and chert (Osborne et al., 1989). The Knox Group consists of light medium gray, fine to medium crystalline, variably bedded to laminated, siliceous dolomite and dolomitic limestone (Osborne and Szabo, 1984).

Eight DPT soil borings were installed at the Forestry Compound at depths ranging from 4 to 12 feet bgs. DPT refusal was encountered in five of the borings at depths ranging from 4 feet to 11 feet bgs. Based on lithologic descriptions recorded during DPT soil boring installation, residuum beneath the Forestry Compound consists predominantly of light brown silt overlying light to reddish-brown clay. Except for one soil boring (HR-84-GP05), the clay was encountered at approximately 1 foot bgs and extended to the bottom of each borehole. In boring HR-84-GP05, only silt was encountered prior to reaching DPT refusal at 4 feet bgs. Neither groundwater nor bedrock was encountered during DPT activities at the Forestry Compound.

4.2 Surface Water Hydrology

Precipitation in the form of rainfall averages about 54 inches annually in Anniston, Alabama, with infiltration rates annually exceeding evapotranspiration rates (U.S. Department of Commerce, 1998). The major surface water feature at Pelham Range is Cane Creek, which flows west through the central portion of Pelham Range. Cane Creek and its associated tributaries drain almost all of Pelham Range. Other surface water features at Pelham Range include Lake Contreras, Cane Creek Lake, Willet Springs, and the Blue Hole (SAIC, 2000). Cane Creek ultimately empties into the Coosa River on the western boundary of Calhoun County.

There are no major surface water features in the immediate vicinity of the Forestry Compound. A tributary to Cane Creek is located approximately 1,500 feet north of the site and flows west-southwest. Cane Creek is located approximately 1.8 miles south of the Forestry Compound.

Surface water runoff at the Forestry Compound flows northwest and collects in a drainage ditch that parallels Gate 5 Road. Water collected in the drainage ditch flows to the southwest.

5.0 Summary of Analytical Results

The results of the chemical analysis of samples collected at the Forestry Compound, Parcel 84(7), indicate that metals, VOCs, and chlorinated pesticides were detected in site media. SVOCs, organophosphorus pesticides, and chlorinated herbicides were not detected in any of the samples collected. To evaluate whether the detected constituents present an unacceptable risk to human health and the environment, the analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC.

Metals concentrations exceeding the SSSLs and ESVs were subsequently compared to metals background screening values to determine if the metals concentrations are within natural background concentrations (SAIC, 1998). Summary statistics for background metals samples collected at FTMC are included in Appendix F.

Six compounds were quantified by both SW-846 Method 8260B (as VOCs) and Method 8270C (as SVOCs), including 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 1,3-dichlorobenzene, 1,2-dichlorobenzene, hexachlorobutadiene, and naphthalene. Method 8260B yields a reporting limit of 0.005 milligrams per kilogram (mg/kg), while Method 8270C has a reporting limit of 0.330 mg/kg, which is typical for a soil matrix sample. Because of the direct nature of the Method 8260B analysis and its resulting lower reporting limit, this method should be considered superior to Method 8270C when quantifying low levels (0.005 to 0.330 mg/kg) of these compounds. Method 8270C and its associated methylene chloride extraction step is superior, however, when dealing with samples that contain higher concentrations (greater than 0.330 mg/kg) of these compounds. Therefore, all data were considered and none were categorically excluded. Data validation qualifiers were helpful in evaluating the usability of data, especially if calibration, blank contamination, precision, or accuracy indicator anomalies were encountered. The validation qualifiers and concentrations reported (e.g., whether concentrations were less than or greater than 0.330 mg/kg) were used to determine which analytical method was likely to return the more accurate result.

The following sections and Tables 5-1 and 5-2 summarize the results of the comparison of detected constituents to the SSSLs, ESVs, and background screening values. Complete analytical results are presented in Appendix D.

5.1 Surface and Depositional Soil Analytical Results

Eight surface soil samples and four depositional soil samples were collected for chemical analysis at the Forestry Compound, Parcel 84(7). Surface and depositional soil samples were collected from the upper 1 foot of soil at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs, ESVs, and metals background screening values, as presented in Table 5-1.

Metals. Twenty-one metals were detected in surface and depositional soil samples collected at the site. The concentrations of seven metals (aluminum, antimony, arsenic, chromium, iron, manganese, and vanadium) exceeded SSSLs. Of these metals, aluminum (four locations), antimony (five locations), arsenic (four locations), chromium (one location), manganese (five locations), and vanadium (one location) results also exceeded their respective background concentrations. With the exception of the antimony results, these metals concentrations were within the range of background values established by SAIC (Appendix F). The antimony concentrations (3.98 to 5.67 mg/kg) that exceeded the SSSL (3.11 mg/kg) and the upper background range (2.6 mg/kg) were flagged with a "J" data qualifier, indicating that the metal was positively identified but the concentrations were estimated.

The following metals were detected at concentrations exceeding ESVs and their respective background concentrations: aluminum (four locations), arsenic (four locations), antimony (five locations), barium (one location), chromium (one location), cobalt (one location), copper (one location), lead (three locations), manganese (five locations), mercury (one location), vanadium (one location), and zinc (five locations). Except for the antimony results (3.98 to 5.67 mg/kg), one copper result (63 mg/kg), and one lead result (124 mg/kg), the metals concentrations that exceeded ESVs and their respective background concentrations were within the range of background values (Appendix F).

Volatile Organic Compounds. Five VOCs (2-butanone, acetone, methylene chloride, toluene, and trichlorofluoromethane) were detected in surface and depositional soil samples

collected at the site. VOC concentrations in the surface and depositional soil samples ranged from 0.00083 mg/kg to 0.45 mg/kg.

The VOC concentrations in surface and depositional soils were below SSSLs and ESVs.

Pesticides. A total of seven pesticides (4,4'-dichlorodiphenyldichloroethane [DDD], 4,4'-dichlorodiphenyldichloroethene [DDE], 4,4'- dichlorodiphenyltrichloroethane [DDT], heptachlor, heptachlor epoxide, methoxychlor, and alpha-chlordane) were detected in five of the 12 surface and depositional soil samples collected at the site. Pesticides were not detected in the remaining surface and depositional soil samples. The pesticide results were flagged with a "J" data qualifier, indicating that the compounds were positively identified but the concentrations were estimated. Pesticide concentrations in the surface and depositional soil samples ranged from 0.00044 mg/kg to 0.0073 mg/kg.

Pesticide concentrations in surface and depositional soils were below SSSLs. The concentrations of 4,4'-DDD (0.003 mg/kg) and 4,4'-DDT (0.0033 mg/kg) marginally exceeded their respective ESVs (0.0025 mg/kg for each compound) at one sample location (HR-84-GP02).

5.2 Subsurface Soil Analytical Results

Eight subsurface soil samples were collected for chemical analysis at the Forestry Compound, Parcel 84(7). Subsurface soil samples were collected at depths greater than 1 foot bgs at the locations shown on Figure 3-1. Analytical results were compared to residential human health SSSLs and metals background concentrations, as presented in Table 5-2.

Metals. Twenty metals were detected in subsurface soil samples collected at the site. The concentrations of eight metals (aluminum, antimony, arsenic, chromium, iron, manganese, vanadium, and thallium) exceeded SSSLs. Of these metals, aluminum (four locations), antimony (five locations), arsenic (four locations), chromium (four locations), iron (one location), manganese (one location), and vanadium (two locations) results also exceeded their respective background concentrations. With the exception of the antimony results (4.13 to 7.39 mg/kg), two arsenic results (64.8 and 39.2 mg/kg), and one chromium result (56.9 mg/kg), these metals concentrations were within the range of background values (Appendix F).

Volatile Organic Compounds. Two VOCs (acetone and methylene chloride) were detected in subsurface soil samples collected at the site. The acetone and methylene chloride results were below SSSLs.

Pesticides. Pesticides were not detected in the subsurface soil samples collected at the site.

5.3 Preliminary Risk Assessment

A preliminary risk assessment (PRA) was performed to further characterize the potential threat to human health from exposure to environmental media at the Forestry Compound, Parcel 84(7). The PRA approach was developed at the request of EPA and ADEM to provide a fast and inexpensive estimation of risk for relatively simple sites. It was derived from the streamlined risk assessment (SRA) protocol developed for FTMC and documented in the installation-wide work plan (IT, 1998). A PRA is a simplified version of an SRA, differing primarily in that the maximum detected concentration (MDC) rather than an estimate of average is adopted as the source-term concentration (STC) for use in the risk assessment. Documentation is not provided herein to save space and time. However, a PRA cannot be less conservative (protective) than a SRA and is generally more protective. The PRA for Parcel 84(7) is included as Appendix G. It discusses the environmental media of interest, selection of site-related chemicals, selection of chemicals of potential concern (COPC), risk characterization, and conclusions.

The foundation of the SRA (and the PRA) is the SSSL, which incorporates all the exposure and toxicological assumptions and precision of a full-blown baseline risk assessment. SSSLs are receptor-, medium- and chemical-specific risk-based concentrations that are used to screen media to select COPCs and to characterize the risk, i.e., compute the incremental lifetime cancer risk (ILCR) and hazard index (HI) for noncancer effects associated with exposure to the media at the site.

The SSSLs applied to a given site represent the most highly exposed receptor scenario for each of several plausible uses for the site. Both the residential and National Guardsperson receptor scenarios were evaluated for Parcel 84(7). COPCs were selected from the site-related chemicals identified in the previous sections by comparing the MDC of the site-related chemical with the appropriate SSSL. Chemicals that were identified as not being site-related were dropped from further consideration because their presence was not attributed to site activities. The COPCs selected in this manner are the chemicals in each medium that may contribute significantly to

cancer risk or to the potential for noncancer effects. As noted above, the MDC was selected as the STC for use in risk characterization. ILCR and HI values were estimated for each COPC in each medium and were summed to obtain total ILCR and HI values for each receptor.

Arsenic in subsurface soil was identified as the only "risk driver," yielding unacceptable ILCR and HI values for residential exposure. There is, however, no plausible way for exposure to subsurface soil without simultaneous exposure to surface soil. Therefore, the surface and subsurface soil data sets were combined and a new STC was calculated for arsenic. ILCR and HI estimates based on the new STC for arsenic fell within acceptable limits. It was concluded that exposure to combined surface and subsurface soil is unlikely to result in unacceptable cancer risk or adverse noncancer health effects for residential exposure or any other standard receptor scenario.

6.0 Summary, Conclusions, and Recommendations

IT, under contract with USACE, completed an SI at the Forestry Compound, Parcel 84(7), at FTMC in Calhoun County, Alabama. The SI was conducted to determine whether chemical constituents are present at the site at concentrations that present an unacceptable risk to human health or the environment. The SI at the Forestry Compound, Parcel 84(7), consisted of the sampling and analysis of eight surface soil samples, four depositional soil samples, and eight subsurface soil samples.

Chemical analysis of samples collected at the Forestry Compound, Parcel 84(7), indicates that metals, VOCs, and chlorinated pesticides were detected in site media. SVOCs, organophosphorus pesticides, and chlorinated herbicides were not detected in any of the samples collected. Analytical results were compared to the human health SSSLs and ESVs for FTMC. The SSSLs and ESVs were developed by IT for human health and ecological risk evaluations as part of the ongoing SIs being performed under the BRAC Environmental Restoration Program at FTMC. Additionally, metals concentrations exceeding SSSLs and ESVs were compared to media-specific background screening values. A preliminary risk assessment was also performed to further characterize the potential threat to human health.

Although the Forestry Compound, Parcel 84(7), is under the control of the Alabama Army National Guard and is projected for continued use in military training operations, the SI analytical data were screened against residential human health SSSLs to evaluate the site for possible unrestricted land reuse. Based on the results of the SI, the site can be released for unrestricted use requiring no further action.

Three metals (antimony, copper, and lead) and two pesticides (4,4'-DDD and 4,4'-DDT) were identified as chemicals of potential ecological concern in surface soils at the Forestry Compound. However, the site is fenced and is projected for continued use by the Alabama Army National Guard. The site does not support substantial ecological habitat. Therefore, the potential threat to ecological receptors is expected to be minimal.

Based on the results of the SI, past operations at the Forestry Compound, Parcel 84(7), do not appear to have adversely impacted the environment. The metals and chemical compounds detected in site media do not pose an unacceptable risk to human health and the environment.

Therefore, IT recommends "No Further Action" and unrestricted land reuse with regard to hazardous, toxic, and radioactive waste at the Forestry Compound, Parcel 84(7).

7.0 References

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